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Abstract

A total of 160 steers grazed "˜Red River' crabgrass pastures that were either fertilized with additional nitrogen (N) or interseeded with lespedeza during the summers of 1998, 1999, 2000, and 2001. Wheat was also grazed in 1999, 2000, and 2001 prior to crabgrass emergence. Legume cover, forage dry matter production, grazing steer performance, and subsequent feedlot performance were measured. Available forage dry matter and grazing steer performance were similar between pastures of crabgrass fertilized with additional N and those interseeded with lespedeza in 1998, 1999, and 2000. In 1999, finishing feed intake, finishing gain and ribeye area were higher ($P<0.05$) for steers that grazed pastures with lespedeza. In 2001, wheat grazing gain, overall grazing performance, finishing gain, and overall performance (grazing + finishing) were higher ($P<0.05$) for steers that grazed pastures fertilized with additional N. Total grazing gain per acre (wheat + crabgrass) was similar between pastures fertilized with additional N and those interseeded with lespedeza and averaged 304, 452, and 406 lb/acre in 1999, 2000, and 2001, respectively. In conclusion, the crabgrass wheat double-crop system produced satisfactory cattle performance with grazing gains being similar ($P>0.05$) between pastures fertilized with additional N and those interseeded with lespedeza. Therefore, economics rather than cattle performance would likely determine which option a producer might select. This study will be continued for three additional grazing seasons with no additional crabgrass being seeded to determine whether crabgrass will voluntarily re-seed itself sufficiently to sustain the system.

Keywords

Cattlemen's Day, 2003; Kansas Agricultural Experiment Station contribution; no. 03-272-S; Report of progress (Kansas State University. Agricultural Experiment Station and Cooperative Extension Service); 908; Beef; Interseeding lespedeza; Interseeded; Crabgrass pasture; Nitrogen fertilization; Forage production; Cattle performance

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INTERSEEDING LESPEDEZA INTO CRABGRASS PASTURE VERSUS ADDITIONAL NITROGEN FERTILIZATION ON FORAGE PRODUCTION AND CATTLE PERFORMANCE

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Summary

A total of 160 steers grazed 'Red River' crabgrass pastures that were either fertilized with additional nitrogen (N) or interseeded with lespedeza during the summers of 1998, 1999, 2000, and 2001. Wheat was also grazed in 1999, 2000, and 2001 prior to crabgrass emergence. Legume cover, forage dry matter production, grazing steer performance, and subsequent feedlot performance were measured. Available forage dry matter and grazing steer performance were similar between pastures of crabgrass fertilized with additional N and those interseeded with lespedeza in 1998, 1999, and 2000. In 1999, finishing feed intake, finishing gain and ribeye area were higher ($P<0.05$) for steers that grazed pastures with lespedeza. In 2001, wheat grazing gain, overall grazing performance, finishing gain, and overall performance (grazing + finishing) were higher ($P<0.05$) for steers that grazed pastures fertilized with additional N. Total grazing gain per acre (wheat + crabgrass) was similar between pastures fertilized with additional N and those interseeded with lespedeza and averaged 304, 452, and 406 lb/acre in 1999, 2000, and 2001, respectively. In conclusion, the crabgrass wheat double-crop system produced satisfactory cattle performance with grazing gains being similar ($P>0.05$) between pastures fertilized with additional N and those interseeded with lespedeza. Therefore, economics rather than cattle performance would likely determine which option a producer might select. This study will be continued for three additional grazing seasons with no additional crabgrass being seeded to determine whether crabgrass will voluntarily re-seed itself sufficiently to sustain the system.

Introduction

Cattlemen in southeastern Kansas, eastern Oklahoma, and western Arkansas need high quality forages to complement grazing of tall fescue. Complementary forages are especially needed during the summer months when fescue forage production declines and animal performance is reduced by the endophyte typically found in most fescue grown in this region. Crabgrass could fill this niche by providing high-quality forage for summer grazing. A high level of nitrogen (N) fertilization is required for crabgrass. Adding a legume could reduce the amount of N fertilizer required, enhance the utilization of crabgrass, and extend grazing of high-quality forage in late summer. The purpose of this study was to evaluate the effect of interseeding lespedeza into crabgrass pastures on forage availability, grazing stocker steer performance, and subsequent feedlot performance.

Experimental Procedures

Pastures. Korean lespedeza was no-till seeded on April 14 and 15, 1998 at 15 lb/acre on five of ten 4-acre pastures that had been seeded with Red River crabgrass during the summer of 1997. An additional 2 lb/acre of crabgrass seed was broadcast at this time on all 10 pastures. The ground had been worked previously and planted to wheat in the fall of 1997, after the crabgrass had set seed. The wheat was cut for hay in mid May of 1998. All pastures

received 50 lb of N/acre on May 26, 1998 at the time of crabgrass emergence, and an additional 50 lb of N/acre was applied to the five pastures without lespedeza in early August. In 1998, all pastures were clipped on July 6 to a height of approximately 7 inches and mowed for hay on August 17 to control weeds.

'Jagger' hard red winter wheat was planted in the same 10 pastures where crabgrass had been previously grown on October 15, 1998, September 22, 1999, and September 28, 2000 at a rate of 106 lb/acre using a no-till drill. The wheat was planted for grazing in 1999, 2000, and 2001, respectively. Korean lespedeza was no-till seeded on April 7, 1999 at the rate of 19.5 lb/acre; March 15, 2000 at the rate of 18.3 lb/acre; and March 27, 2001 at the rate of 15 lb/acre on the same five pastures that had been seeded with lespedeza during 1998. An additional 2 lb/acre of crabgrass seed was broadcast each year immediately prior to planting lespedeza. All pastures received 68-34-34 lb/acre of N-P_2O_5-K_2O on November 19, 1998; 46 lb of N/acre on March 26, 1999; 48.5 lb of N/acre on May 28, 1999; 77-44-44 lb/acre of N-P_2O_5-K_2O on October 12, 1999; 56 lb of N/acre on May 23, 2000; 71-41-41 lb/acre on November 17, 2000; and 51 lb of N/acre on May 17, 2001. An additional 50 lb of N/acre was applied to pastures without lespedeza on July 16, 1999, July 17, 2000, and July 11, 2001.

Available forage was determined at the initiation of grazing and during the season with a disk meter calibrated for crabgrass and for wheat. One exclosure (15 to 20 square feet) was placed in each pasture. Total production for a grazing period was estimated from three readings per exclosure, and available forage was determined from three readings near each cage. Lespedeza canopy coverage was estimated from the percentage of the disk circumference that contacted a portion of the canopy.

Cattle. In 1998, 40 mixed-breed steers with an initial weight of 702 lb were weighed on consecutive days, stratified by weight, and allotted randomly to the 10 pastures on June 23 to graze crabgrass. In 1999, 2000, and 2001, 50 mixed-breed steers with initial weights of 639 lb, 600 lb, and 554 lb, respectively, were weighed on consecutive days, stratified by weight, and allotted randomly to the 10 pastures on March 30, 1999, March 9, 2000, and March 22, 2001 to graze out wheat and then graze crabgrass. Cattle were weighed on consecutive days when the wheat was nearly completely grazed out and crabgrass had sufficient growth to provide sufficient grazing for the cattle. This weight was used as the ending weight of the wheat grazing phase and the beginning weight of the crabgrass grazing phase. In 1999, cattle grazed wheat from March 30 until May 26 (57 days) and then grazed crabgrass from May 26 until September 1 (98 days). In 2000, cattle grazed wheat from March 9 until May 9 (61 days) and then grazed crabgrass from May 9 until September 6 (120 days). In 2001, cattle grazed wheat from March 22 until May 17 (56 days) and then grazed crabgrass from May 17 until September 6 (112 days). Cattle were treated for internal and external parasites prior to being turned out to pasture and later were vaccinated for protection from pinkeye. Steers had free access to commercial mineral blocks that contained 12% calcium, 12% phosphorus, and 12% salt. In 1998, all pastures were grazed continuously for 98 days at a stocking rate of 1.0 head/acre until grazing was terminated and steers were weighed on September 28 and 29. In 1999, pastures were stocked initially with 1.2 head/acre until August 17, when a steer closest to the pen average weight was removed from each pasture as available forage became limited because of below average rainfall. In 2000 and 2001, a steer closest to the pen average weight was removed from each pasture at the end of the wheat phase. Pastures were then stocked at l.0 head/acre until grazing was terminated and

steers were weighed on August 31 and September 1, 1999; September 5 and 6, 2000; and September 5 and 6, 2001. Pastures were mowed and harvested for hay on September 14, 2000, May 15, 2001, and September 10, 2001 to remove residual forage after grazing.

Following the grazing period, cattle were shipped to a finishing facility and fed a diet of 80% ground milo, 15% corn silage, and 5% supplement (dry matter basis). Cattle that were grazed in 1998, 1999, 2000, and 2001 were fed for 142, 114, 128, and 119 days, respectively. Steers were implanted with Synovex S® on days 0 and 84 of the finishing period. Cattle were slaughtered in a commercial facility at the end of the finishing period, and carcass data was collected.

Results and Discussion

Pastures. Available forage dry matter for 1998 through 2001 is presented in Figure 1. In 1998, available forage was similar between pastures that received additional N fertilizer and those that were interseeded with lespedeza. However, dry matter decreased dramatically for both treatments after mid-August, following mowing for hay coupled with below normal precipitation. Legume coverage averaged 4.7% in pastures interseeded with lespedeza and 1.3% in those that received additional N fertilization. Three pastures were eliminated from the analysis because they contained significant amounts of volunteer ladino clover.

In 1999, available forage dry matter was not significantly different ($P<0.05$) between treatments overall or at any time during the growing season. Available forage dry matter from wheat decreased ($P<0.05$) after April 27 to a low of 660 lb/acre on July 20, then increased somewhat during the crabgrass phase by September 2.

In 2000, available forage dry matter was not significantly different ($P<0.05$) between treatments overall or at any time during the growing season. Available forage dry matter from wheat decreased ($P<0.05$) after April 27 to a low of 1160 lb/acre on June 6, then dry matter increased to its maximum on August 10.

In 2001, available forage dry matter was not significantly different ($P>0.05$) between treatments overall or at any time during the growing season. Available forage dry matter decreased ($P<0.05$) after April 19 to a low of 1160 lb/acre on June 14, then increased through August 10.

Available forage dry matter appeared lower in much of 1999 compared to the other three years. Forage dry matter availability patterns also differed markedly in 1998, when the maximum amount of forage occurred early in the season, whereas the maximum in 2000 and 2001 occurred late in the season. These differences were likely due to a higher initial stocking rate and grazing wheat prior to crabgrass in 2000 and 2001. In 1999, forage availability was relatively low throughout the season, which may be attributed, at least in part, to uneven rainfall distribution and thinner stands of crabgrass and lespedeza. Lespedeza canopy coverage peaked at 10% on August 18, 1998; 5.8% on July 20, 1999; 18% on July 12, 2000; and 19% on August 9, 2001 (Figure 2).

Cattle Performance. Performance of steers that grazed crabgrass pastures either fertilized with additional N or interseeded with lespedeza are shown in Table 1. In 1998, grazing gains, subsequent feedlot performance, and overall performance were similar between pastures with lespedeza and those that received an extra application of N; grazing gains were 1.23 and 1.27 lb/head daily, respectively. Cattle should have been removed from pastures 2 weeks earlier in 1998 to achieve maximum gains.

In 1999, grazing gains were again similar between pastures with lespedeza and those that received an extra application of N. Gains during the wheat phase averaged 2.22 and 2.26

lb/head/day; during the crabgrass phase, 1.30 and 1.25 lb/head/day; and overall, gains averaged 1.64 and 1.62 lb/head/day for pastures interseeded with lespedeza and fertilized with additional N, respectively. Crabgrass gains in 1999 likely were limited by below normal precipitation during the summer months. During the finishing phase, steers that previously grazed pastures interseeded with lespedeza had higher ($P<0.05$) feed consumption, higher gains ($P<0.05$), and larger ($P<0.05$) ribeye areas than those that grazed pastures fertilized with additional N. Because feed efficiency was similar ($P>0.05$) between treatments, the difference in finishing gain was due primarily to the difference in feed intake. Overall performance from the beginning of the grazing phase through the end of the finishing phase was similar ($P>0.05$) between treatments.

During all phases in 2000, grazing gains were again similar between pastures with lespedeza and those that received an extra application of N. Gains during the wheat phase averaged 3.09 and 3.18 lb/head/day for pastures with lespedeza and fertilized with additional N, respectively. During the crabgrass phase, gains averaged 1.74 and 1.82 lb/head/day; and overall, gains averaged 2.19 and 2.28 lb/head/day for pastures interseeded with lespedeza and fertilized with additional N, respectively.

In 2001, steers that grazed pastures fertilized with additional nitrogen had higher ($P<0.05$) wheat grazing gains and overall grazing gains (wheat + crabgrass) than those that grazed pastures interseeded with lespedeza. Gains during the wheat phase averaged 2.56 and 3.11 lb/head/day for pastures with lespedeza and fertilized with additional N, respectively. During the crabgrass phase, gains averaged 1.72 and 1.99 lb/head/day; and overall, gains averaged 2.00 and 2.36 lb/head/day for pastures interseeded with lespedeza and fertilized with additional N, respectively. Finishing gains, overall performance, hot carcass weight, and fat thickness were greater ($P<0.05$) for steers that grazed nitrogen-fertilized pastures than those that grazed pastures interseeded with lespedeza.

Grazing performance averaged over 1999, 2000, and 2001 is presented in Table 2. Daily gain and gain per acre were similar ($P>0.05$) during the wheat phase, crabgrass phase, and overall for steers that grazed pastures fertilized with additional N and those interseeded with lespedeza. Finishing gain and overall gains (grazing + finishing) were also similar ($P>0.05$) between treatments.

Although there was no difference ($P>0.05$) in grazing performance between cattle that grazed pastures fertilized with additional N and those that grazed pastures interseeded with lespedeza, grazing performance varied significantly ($P<0.05$) between years. Daily gains from grazing wheat ranged from 2.24 lb/day in 1999 to 3.14 lb/day in 2000. Wheat grazing gains were higher ($P<0.05$) in 2000 and 2001 than in 1999. Gain per acre from grazing wheat ranged from 160 lb in 1999 to 239 lb in 2000. Performance of cattle that grazed crabgrass improved with time. This may be attributed to improvement in crabgrass stands. Daily gains from grazing crabgrass ranged from 1.25 lb per day in 1998 to 1.85 lb per day in 2001. Daily gains were higher ($P<0.05$) in 2000 and 2001 than in 1998 and 1999. Gain per acre from grazing crabgrass ranged from 123 lb in 1998 to 213 lb in 2000. Gain per acre was higher ($P<0.05$) in 2000 and 2001 than in 1998 and 1999. Overall grazing performance (wheat + crabgrass) also improved with time. Overall daily gains and gain per acre were higher ($P<0.05$) in 2000 and 2001 than in 1999. Overall daily gain ranged from 1.63 lb in 1999 to 2.24 lb in 2000 and overall gain per acre ranged from 304 lb in 1999 to 452 lb in 2000.

In conclusion, grazing performance was similar from wheat + crabgrass pastures fertilized with additional N and those interseeded

with lespedeza. Both treatments produced satisfactory cattle performance which tended to improve each successive grazing season. This study will be continued for at least three more grazing seasons with no additional crabgrass being seeded to determine if the crabgrass will voluntarily re-seed itself sufficiently to sustain the system.

Table 1. Effects of Interseeding Legumes vs. Nitrogen Fertilization on Performance of Steers Grazing Wheat-Crabgrass Pastures, Southeast Agricultural Research Center

	1998		1999		2000		2001	
Item	Nitrogen	Lespedeza	Nitrogen	Lespedeza	Nitrogen	Lespedeza	Nitrogen	Lespedeza
Grazing Phase - Wheat								
No. of days	-	-	57	57	61	61	56	56
No. of head	-	-	15	20	15	20	15	20
Initial weight, lb	-	-	639	639	600	600	554	554
Ending weight, lb	-	-	768	766	794	789	727	697
Gain, lb	-	-	129	127	194	189	174	144
Daily gain, lb	-	-	2.26	2.22	3.18	3.09	3.11[a]	2.56[b]
Gain/acre, lb	-	-	161	158	242	236	218	180
Hay production, lb/acre	-	-	-	-	-	-	1563	1660
Grazing Phase – Crabgrass								
No. of days	98	98	98	98	120	120	112	112
No. of head	12	16	12[c]	16[c]	12	16	12	16
Initial weight, lb	702	702	772	766	786	785	729[a]	697[b]
Ending weight, lb	827	823	895	893	1005	994	952[a]	889[b]
Gain, lb	124	121	122	128	218	208	223	192
Daily gain, lb	1.27	1.23	1.25	1.30	1.82	1.74	1.99	1.72
Gain/acre, lb	124	121	142	145	218	208	223	192
Hay production, lb/acre	-	-	-	-	605	605	666	838
Overall Grazing Performance (Wheat + Crabgrass)								
No. of days	-	-	155	155	181	181	168	168
Gain, lb	-	-	251	254	412	397	397[a]	336[b]
Daily gain, lb	-	-	1.62	1.64	2.28	2.19	2.36[a]	2.00[b]
Gain/acre, lb	-	-	303	304	460	444	440	372
Finishing Phase								
No. of days	142	142	114	114	128	128	119	119
No. of head	12	16	12	16	12	16	12	16
Starting weight, lb	827	823	895	893	1005	994	952[a]	889[b]
Final weight, lb	1253	1239	1350	1400	1421	1388	1428[a]	1323[b]
Gain, lb	426	416	456[a]	507[b]	416	394	476[a]	434[b]
Daily gain, lb	3.00	2.93	4.00[a]	4.45[b]	3.25	3.08	4.00[a]	3.65[b]
Daily dry matter intake, lb	26.3	26.9	29.7[a]	33.3[b]	30.1	29.2	27.4	25.1
Feed/gain	8.77	9.18	7.42	7.49	9.25	9.53	6.85	6.88
Hot carcass weight, lb	764	756	794	824	835	830	845[a]	784[b]
Dressing %	61.0	61.0	58.8	58.8	58.8	59.8	59.2	59.2
Backfat, inch	0.36	0.34	0.60	0.54	0.58	0.65	0.56[a]	0.42[b]
Ribeye area, inch^2	12.8	13.1	12.3[a]	13.2[b]	13.6	13.5	13.5	13.1
Yield grade	2.6	2.4	3.5	3.0	3.2	3.4	3.2	2.7
Marbling score	SM[16]	SM[43]	SM[46]	SM[93]	MT[15]	MT[16]	MT[30]	MT[26]
% Choice	65	75	67	92	75	100	100	94
Overall Performance (Grazing + Finishing Phase)								
No. of days	-	-	269	269	309	309	287	287
Gain, lb	-	-	708	761	821	788	874[a]	768[b]
Daily gain, lb	-	-	2.64	2.83	2.65	2.55	3.05[a]	2.68[b]

[a,b]Means within a row within the same year with the same letter are not significantly different (P<0.05).
[c]Pastures were stocked with 1.2 steers per acre for 83 days and then 1 steers per acre for the final 15 days.

Table 2. Effects of Additional Nitrogen Fertilization and Interseeding Lespedeza on Performance of Steers Grazing Wheat-Crabgrass Pastures, Southeast Agricultural Research Center (1999, 2000, 2001)

	Treatment	
Item	N Fertilization	Lespedeza
Grazing Phase – Wheat		
Daily gain, lb	2.85	2.62
Gain/acre, lb	207	191
Grazing Phase – Crabgrass		
Daily gain, lb	1.69	1.59
Gain/acre, lb	194	182
Overall Grazing Performance (Wheat + Crabgrass)		
Daily gain, lb	2.09	1.94
Gain/acre, lb	401	373
Finishing daily gain, lb	3.75	3.73
Overall daily gain (grazing + finishing), lb	2.78	2.69

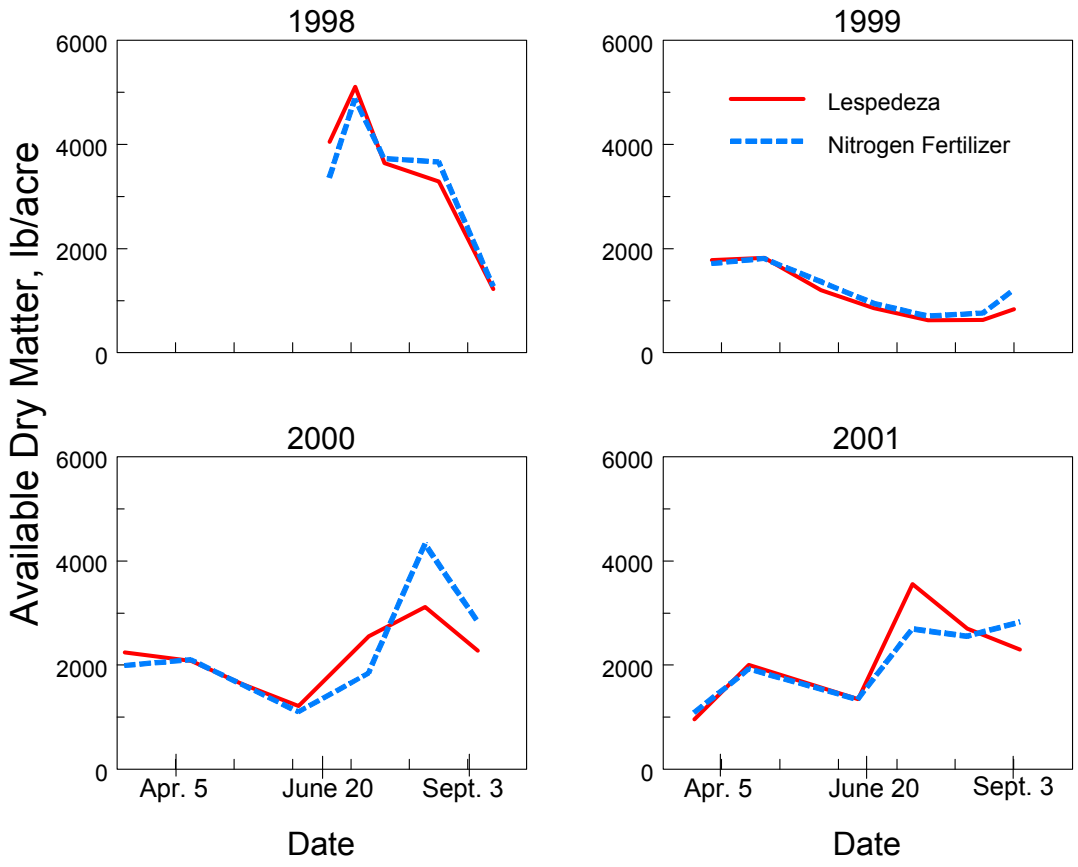

Figure 1. Available Forage in Wheat and Crabgrass Pastures, 1998-2001, Southeast Agricultural Research Center.

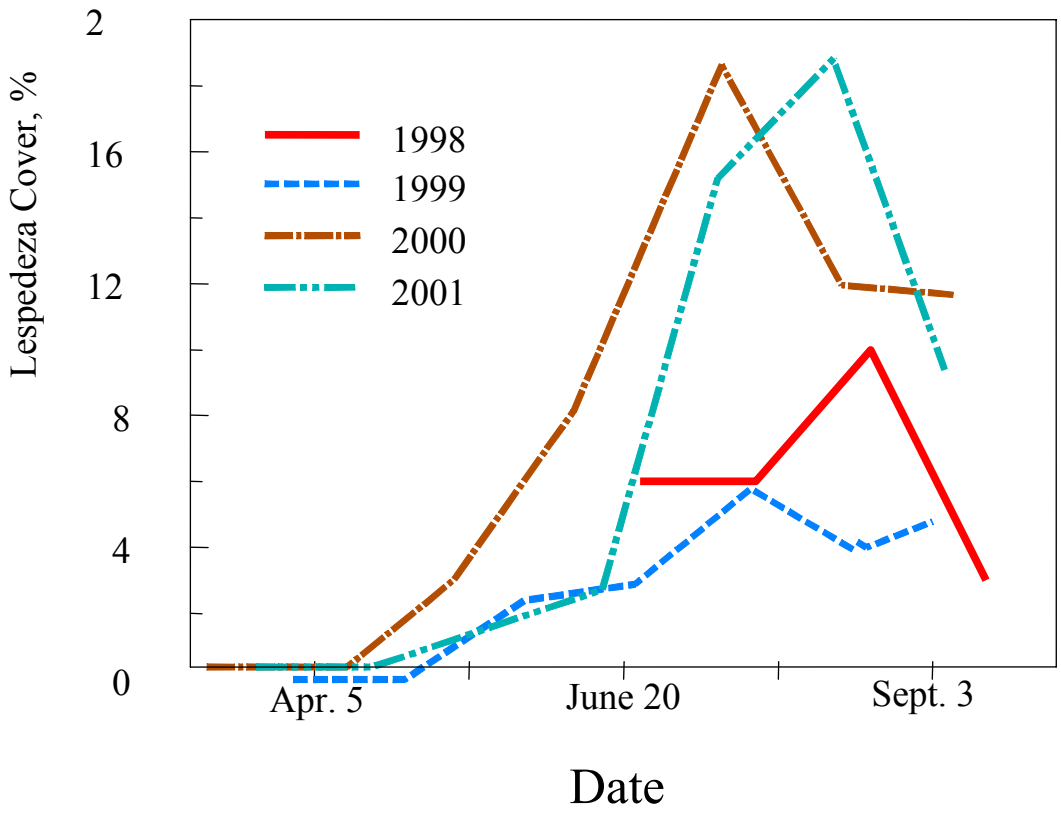

Figure 2. Lespedeza Canopy Cover in Wheat and Crabgrass Pastures, 1998-2001, Southeast Agricultural Research Center.